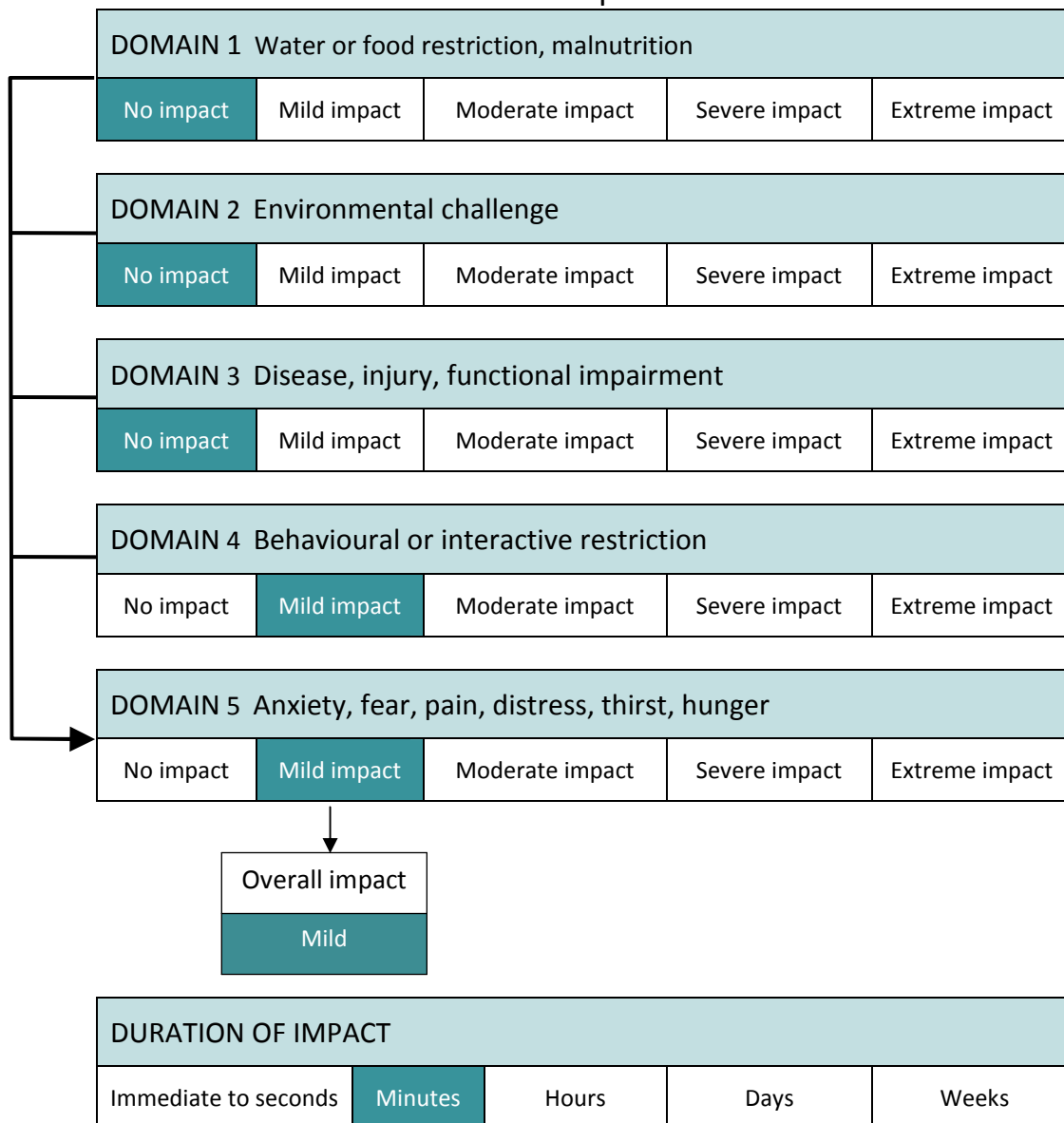


Control method: Fumigation of rabbit warrens with phosphine

Assumptions:	<ul style="list-style-type: none"> Best practice is followed in accordance with the standard operating procedure RAB005. Phosphine gas (PH₃) is produced by aluminium-phosphide tablets (e.g. Phostoxin[®] or Gastion[®]) or magnesium-phosphide tablets (e.g. Magtoxin[®]).
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PART A: assessment of overall welfare impact



SCORE FOR PART A:	3
Summary of evidence:	
Domain 1	No impact in this domain.
Domain 2	No impact in this domain.

Domain 3	No impact in this domain.
Domain 4	<p>Prior to fumigation, rabbits are driven underground into the warren by making loud noises (e.g. riding motorbikes) and using dogs. These disturbances are likely to cause “flight or fight” stress responses that are similar to those seen when prey escape a predator. These endocrine responses are short lived and stress hormone levels quickly return to normal¹.</p> <p>Rabbits react to fumigation by confining themselves to parts of the warren farthest from entrances, attempting to dig out of the warren at a blocked entrance, making a new exit where a burrow passes close to the surface or moving around the warren system in a disturbed state³.</p>
Domain 5	There are no initial signs of distress prior to gas concentration building to lethal levels. The first signs of toxicosis include agitation, uncoordinated movement, lethargy and shallow breathing ⁴ .

PART B: assessment of mode of death

Time to insensibility (minus any lag time)				
Very rapid	Minutes	Hours	Days	Weeks
Level of suffering (after application of the method that causes death but before insensibility)				
No suffering	Mild suffering	Moderate suffering	Severe suffering	Extreme suffering

SCORE FOR PART B:	D
Summary of evidence:	
Duration –	<p>Phosphine is a systemic poison which depresses the central nervous system and respiratory function⁵.</p> <p>Time to onset of symptoms is variable as the spread of gas through a warren relies on diffusion^{2,3}. However, spread is relatively rapid and can be increased by the addition of water². Time to death (from when tablets are placed in a warren) is on average 225 minutes (range 119-385 minutes)³. Time from the onset of symptoms to death is about 30 minutes³.</p> <p>There may be a high risk of sublethal dosing (due to variability in concentration in warrens) but it is likely that the effects of sublethal exposure will be relatively small and affected rabbits will make a complete recovery, similar to the recovery seen in rats⁴.</p>
Suffering –	<p>The primary mode of action of phosphine is inhibition of cytochrome oxidase in the respiratory metabolism pathway, with additional direct cytotoxicity. Exposure to high concentrations of phosphine in vertebrates leads to a profound fall in blood pressure followed by death⁵. Lower concentrations cause pulmonary oedema which may result in death but occurs over a longer duration.</p> <p>Signs in rabbits after collapse include gasping, convulsions and paddling³.</p> <p>If the concentration of phosphine is high there will be a relatively short duration of severe signs prior to death. At lower concentrations the animal is likely to suffer for longer.</p>

Summary

CONTROL METHOD:	Fumigation of rabbit warrens with phosphine
OVERALL HUMANENESS SCORE:	3D
Comments Symptoms of phosphine poisoning by inhalation in humans include headache, fatigue, nausea, vomiting, cough and shortness of breath. There is often central nervous system, gastrointestinal and respiratory system involvement and in some cases there is also damage to the liver, urinary tract, heart and peripheral muscles ⁶ .	

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